

CLAIMS

What is claimed is:

- 1 1. A medical device comprising:
2 a substrate having openings, and
3 a fibrous coating wherein at least one fiber is threaded through the opening in
4 said substrate.
- 1 2. The device of claim 1, wherein the fiber comprises at least one nanofiber.
- 1 3. The device of claim 1, wherein the fibrous coating is substantially mechanically
2 attached to the substrate.
- 1 4. The device of claim 1, wherein the substrate is selected from the group consisting of
2 a stent and a surgical mesh.
- 1 5. The device of claim 1, wherein the fibrous coating has at least one polymeric
2 component selected from the group consisting of polycaprolactone, polylactic acid,
3 polyglycolic acid, polydioxanone, polyanhydride, trimethylene carbonate, poly(beta-
4 hydroxybutyrate), poly(g-ethylglutamate), poly(DTH iminocarbonate),
5 poly(bisphenol A iminocarbonate), poly (ortho ester), polycyanoacrylate,
6 polyphosphazene, nylons, polyesters, polyethylene terephthalate, silicon-containing
7 polymers, elastomeric silicone polymers, polypropylene, polyolefins, polyolefin
8 copolymers, elastomeric polyolefins, modified polysaccharides, cellulose, chitin,
9 dextran, modified proteins, fibrin, casein, an adhesive polymer, collagen, and
10 fibrinogen.
- 1 6. The device of claim 1, wherein the fibrous coating comprises a nanofibrous sheet.
- 1 7. The device of claim 6, wherein the nanofibrous sheet comprises polypropylene.

- 1 8. The device of claim 1, wherein the fibrous coating is attached to the substrate by at
2 least one melted nanofiber.
- 1 9. The device of claim 1, wherein the fibrous coating is attached to the substrate by at
2 least one nanofiber that has melted and mechanically attached to at least another
3 nanofiber, or the substrate.
- 1 10. The device of claim 1, wherein the fibrous coating has been mechanically attached to
2 the substrate by a heating method.
- 1 11. The device of claim 10, wherein the heating method is selected from the group
2 consisting of heat sealing, spot heating with a pattern of hot wires, and spot heating
3 with a laser.
- 1 12. A process comprising the step of using the device of claim 1 in a medical procedure
2 comprising implantation into a living organism.
- 1 13. A method for attaching a fibrous coating to a substrate comprising the step of:
2 pushing at least a portion of the fibrous coating through at least one hole in
3 the substrate.
- 1 14. The method of claim 13 for attaching a fibrous coating to a substrate further
2 comprising the steps of:
3 adding at least one nanofiber to a fluid; and
4 passing the fluid through at least one hole in the substrate so that at least a
5 portion of a nanofiber also passes or pushes through the at least one hole in the
6 substrate.
- 1 15. The method of claim 13 for attaching a fibrous coating to a substrate, wherein the
2 pushing step further comprises:

3 using a fluid jet to push at least a portion of the fibrous coating through the at
4 least one hole in the substrate.

1 16. The method of claim 13, wherein the fibrous coating includes polypropylene fibers.

1 17. The method of claim 13, wherein the fibrous coating includes polypropylene
2 nanofibers.

1 18. The method of claim 13, wherein the fibrous coating is formed by electrospinning at
2 least one fiber onto a surface of the substrate.

1 19. The method of claim 13, wherein the fibrous coating is formed using a nanofibers by
2 gas jet method to manufacture at least one fiber directly onto the substrate.

1 20. The method of claim 13, wherein fibrous coating is formed using an electrospinnable
2 solution having a temperature sufficient to dissolve the polymer solution.

1 21. The method of claim 20, wherein the polymer solution comprises polypropylene,
2 polyolefins, or polyolefin copolymers.

1 22. A method for attaching a fibrous coating to a substrate comprising the steps:
2 providing a substrate;
3 coating a first side of the substrate with a fibrous coating; and
4 forcing at least one fiber through an opening in the substrate.

1 23. The method of claim 22, wherein the step of forcing at least one fiber through an
2 opening in a substrate is performed by:

3 adding at least one fiber to a fluid to thereby form a fiber-fluid solution;
4 and

5 passing the fiber-fluid solution through at least one hole in an device wall
6 so that the fiber is threaded by the fluid into the at least one hole in the device wall.

1 24. The method of claim 22, wherein the device is a stent or substrate and the substrate
2 is a stent wall or a surgical-mesh wall.

1 25. The method of claim 22 for attaching a fibrous coating to a substrate further
2 comprising the step:

3 pulling at least a portion of the fibrous coating through at least one hole in the
4 substrate.

1 26. The method of claim 22, wherein the step of pulling at least a portion of the fibrous
2 coating through the at least one hole in the substrate is performed by pulling a
3 substantially needle-like object through at least one hole in the substrate, wherein a
4 portion of the fibrous coating is pulled through the at least one hole by the needle-
5 like object.

1 27. The method of claim 22, wherein the step of pulling at least a portion of the fibrous
2 coating through the at least one hole in the substrate is achieved by performing the
3 additional steps:

4 inserting a portion of at least one substantially needle-like object through
5 the at least one hole;

6 attaching at least one nanofiber to the substantially needle-like object; and

7 withdrawing the substantially needle-like object from the at least one hole
8 so that the at least one nanofiber is pulled through the at least one hole.

1 28. The method of claim 22 for attaching a fibrous coating to a substrate further
2 comprising the steps:

3 applying a positively-charged fibrous coating to a first side of the substrate;
4 and

5 applying a negatively-charged fibrous coating to a second side of the
6 substrate.

1 29. The method of claim 22, further including

2 coating a second side of the substrate with at least a second fiber;

3 wherein the fibrous coating or the at least a second fiber is contact
4 adhesive, and

5 wherein the fibrous coating and the at least a second fiber contact each
6 other so that at least a portion of the fibrous coating and the at least a second fiber
7 forms an adherent joint.

1 30. The method of claim 22 for attaching a fibrous coating to a substrate further
2 comprising the step:

3 heat treating a fibrous coating, wherein the heat treatment causes at least
4 one nanofiber to melt and form an adherent joint with at least, another nanofiber,
5 or the substrate.

1 31. The method of claim 30, wherein the heat treating step further comprises using a
2 laser, a heating element, or a combination thereof.

1 32. A means for mechanically attaching a fibrous coating to a substrate.

1 33. The means of claim 32, wherein the fibrous coating comprises at least one nanofiber

1 34. The means of claim 33, wherein the fibrous coating comprises a free-standing
2 fibrous polymer sheet